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(71)Applicant : TOKYO ELECTRON LTD

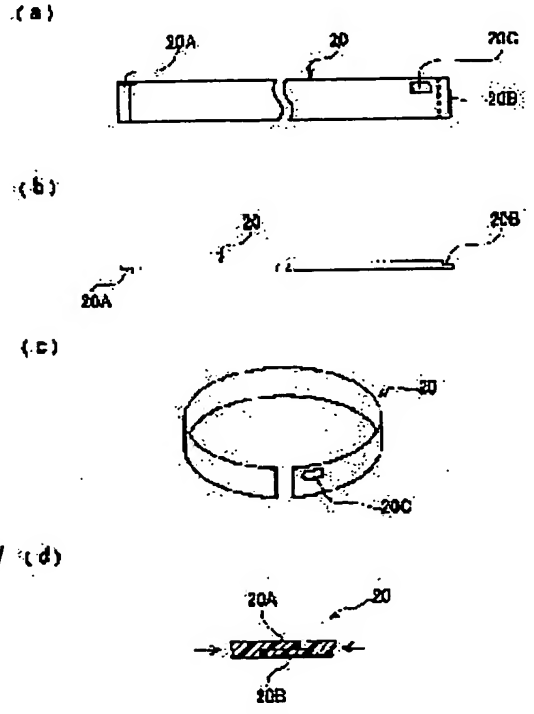
(72)Inventor : TOMOYOSHI TSUTOMU
KOIZUMI KATSUYUKI

(54) PLASMA PROCESSING APPARATUS AND ITS ASSEMBLING METHOD

(57)Abstract:

PROBLEM TO BE SOLVED: To overcome the problem of a prior art such that plasma processing is affected adversely when the surface of a shield member 9 is cut off partially by plasma and the surface treatment film is eliminated and, since a decision is made that the life of the shield member 9 has expired even when a limited part thereof is cut off, the shield member 9 must be replaced and a high cost is imposed for replacing the shield member 9.

SOLUTION: The plasma processing apparatus 10 comprises a lower electrode 12 for supporting a wafer W in a chamber 11, a member 19 for shielding the inner circumferential surface of the chamber 11 from plasma for processing the wafer W supported by the lower electrode 12, and a baffle plate 18 disposed in a gap between the shielding member 19 and the lower electrode 12 in order to discharge gas in the chamber 11 while diffusing, wherein a resin plate 20 is fixed replaceably to the inner circumferential surface of the shielding member 19, and the resin plate 20 is imparted with a compressive stress in the circumferential direction.



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(71)出願人　000219967
東京エレクトロン株式会社
東京都港区赤坂５丁目３番６号
(72)発明者　友吉　力
山梨県韮崎市藤井町北下条2381番地の１
東京エレクトロン山梨株式会社内
(72)発明者　小泉　克之
山梨県韮崎市藤井町北下条2381番地の１
東京エレクトロン山梨株式会社内
(74)代理人　100096910
弁理士　小原　肇

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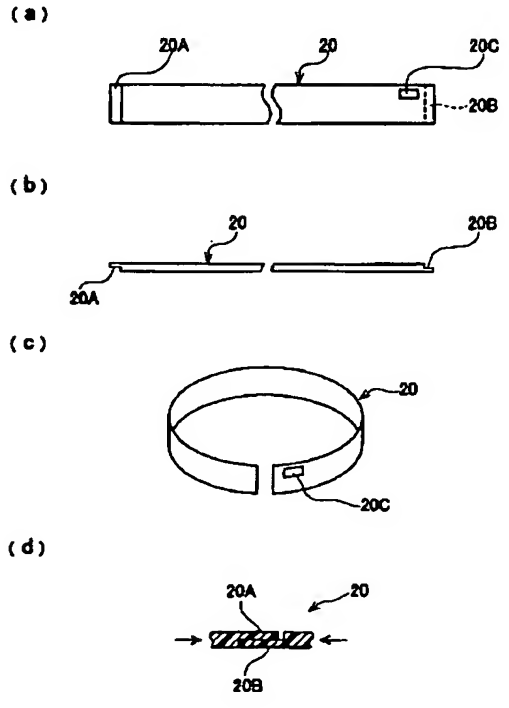
(54)【発明の名称】　プラズマ処理装置及びその組立方法

(57)【要約】
【課題】 遮蔽部材９は表面の一部がプラズマにより削り取られて表面処理膜が無くなると、プラズマ処理に悪影響を及ぼす虞があるため、従来は削り取られた部分が限られた部分であってもその時点で遮蔽部材９の寿命と判断し、遮蔽部材９を交換しなけらばならなず、遮蔽部材９の交換コストが高くなる。
【解決手段】 本発明のプラズマ処理装置１０は、チャンバー１１内でウエハＷを支持する下部電極１２と、この下部電極１２で支持されたウエハＷを処理するためのプラズマからチャンバー１１の内周面を遮蔽する遮蔽部材１９と、この遮蔽部材１９と下部電極１２との隙間に配置され且つチャンバー１１内のガスを分散して排出するバッフルプレート１８とを備え、遮蔽部材１９の内周面に樹脂板２０を交換可能に装着し、且つ樹脂板２０に周方向の圧縮応力を付与したことを特徴とする。



【特許請求の範囲】
【請求項１】 処理容器内でプラズマを発生させ、上記処理容器内に配置された被処理体にプラズマ処理を施すプラズマ処理装置において、上記処理容器のプラズマと接触する内周面に樹脂板を交換可能に装着し、且つ上記樹脂板に周方向の圧縮応力を付与したことを特徴とするプラズマ処理装置。
【請求項２】 処理容器内で被処理体を支持する支持体と、この支持体で支持された被処理体を処理するためのプラズマから上記処理容器の内周面を遮蔽する遮蔽部材と、この遮蔽部材と上記支持体との隙間に配置され且つ処理容器内のガスを分散して排出する分散板とを備えたプラズマ処理装置において、上記遮蔽部材の内周面に樹脂板を交換可能に装着し、且つ上記樹脂板に周方向の圧縮応力を付与したことを特徴とするプラズマ処理装置。
【請求項３】 少なくとも上記分散板で区画されるプラズマ領域に位置する上記遮蔽部材に上記樹脂板を装着したことを特徴とする請求項２に記載のプラズマ処理装置。
【請求項４】 上記樹脂板を帯状または円筒状に形成したことを特徴とする請求項１～請求項３のいずれか１項に記載のプラズマ処理装置。
【請求項５】 上記帯状の樹脂板から円筒状に形成された樹脂板または上記円筒状の樹脂板の外周長さを上記処理容器の内周面または上記遮蔽部材の内周面の円周長さより０．１～０．４％長く設定したことを特徴とする請求項１～請求項４のいずれか１項に記載のプラズマ処理装置。
【請求項６】 処理容器内でプラズマを発生させ、上記処理容器内に配置された被処理体にプラズマ処理を施すプラズマ処理装置を組み立てる方法であって、帯状の樹脂板の両端部を重ねて上記処理容器の内周長さよりも長い外周長さを有する円筒状に形成する工程と、上記円筒状の樹脂板の一部を内側に撓ませて上記処理容器の内面に合わせる工程と、上記撓ませた樹脂板を元の円筒状に復元させて上記樹脂板に周方向の圧縮応力を付与する工程とを備えたことを特徴とするプラズマ処理装置の組立方法。
【請求項７】 処理容器内でプラズマを発生させ、上記処理容器内に配置された被処理体にプラズマ処理を施すプラズマ処理装置を組み立てる方法であって、上記処理容器の内周長さよりも長い外周長さを有する円筒状の樹脂板の一部を内側に撓ませて上記処理容器の内面に合わせる工程と、上記撓ませた樹脂板を元の円筒状に復元させて上記樹脂板に周方向の圧縮応力を付与する工程とを備えたことを特徴とするプラズマ処理装置の組立方法。
【請求項８】 処理容器内で被処理体を支持する支持体と、この支持体で支持された被処理体を処理するためのプラズマから上記処理容器の内周面を遮蔽する遮蔽部材と、この遮蔽部材の内周面に樹脂板を交換可能に装着されたプラズマ処理装置を組み立てる方法であって、帯状の樹脂板の両端部を重ねて上記遮蔽部材の内周長さよりも長い外周長さを有する円筒状に形成する工程と、上記円筒状の樹脂板の一部を内側に撓ませて上記遮蔽部材の内面に合わせる工程と、上記撓ませた樹脂板を元の円筒状に復元させて上記樹脂板に周方向の圧縮応力を付与する工程とを備えたことを特徴とするプラズマ処理装置の組立方法。
【請求項９】 処理容器内で被処理体を支持する支持体と、この支持体で支持された被処理体を処理するためのプラズマから上記処理容器の内周面を遮蔽する遮蔽部材と、この遮蔽部材の内周面に樹脂板を交換可能に装着されたプラズマ処理装置を組み立てる方法であって、上記遮蔽部材の内周長さよりも長い外周長さを有する円筒状の樹脂板の一部を内側に撓ませて上記遮蔽部材の内面に合わせる工程と、上記撓ませた樹脂板を元の円筒状に復元させて上記樹脂板に周方向の圧縮応力を付与する工程とを備えたことを特徴とするプラズマ処理装置の組立方法。
【発明の詳細な説明】
【０００１】
【産業上の利用分野】本発明は、プラズマ処理装置及びその組立方法に関し、更に詳しくは、処理容器の内周面のメンテナンス性を向上させたプラズマ処理装置及びその組立方法に関する。
【０００２】
【従来の技術】プラズマ処理装置は、例えば図６に示すように、所定の真空度を保持できる気密構造の処理容器（以下、「チャンバー」と称す。）１と、このチャンバー１の底面１Ａに配置された載置台を兼ねる下部電極２と、この下部電極２の上方に下部電極２と平行に配置された上部電極３とを備え、上部電極３からチャンバー１内へエッチング等のプラズマ処理用ガスを同図のＡで示すように供給するようにしてある。下部電極２にはバイアス発生用の高周波電源４が整合器４Ａを介して接続され、上部電極３にはプラズマ発生用の高周波電源５が整合器５Ａを介して接続されている。そして、上部電極３からプラズマ処理用ガスを供給しながら上下両電極２、３にそれぞれの高周波電力を印加して上下の電極２、３間で所定のプラズマを発生させ、使用後のガスを矢印Ｂで示すように排気口１Ｂから排気する。
【０００３】また、下部電極２にはチャンバー１の底面１Ａの中央孔を貫通する筒状の支持部材６Ａが接続され、底面１Ａの下方でボールネジ等を有する駆動機構６Ｂに連結されている。支持部材６Ａ上端の外周と底面１Ａ間にはベローズ７が取り付けられている。従って、下部電極２はチャンバー１内で駆動機構６Ｂを介して昇降し、プラズマ処理を行う時には下部電極２は上部電極３との間で所定の隙間を形成するようにしてある。
【０００４】下部電極２の上端近傍にはリング状のバッ

フルプレート８が取り付けられ、使用後のガスをバッフルプレート８を介してチャンバー１内のプラズマ処理部１Ｃから排気部１Ｂへ排出する。また、チャンバー１の内周面には遮蔽部材９が着脱可能に取り付けられ、遮蔽部材９によってチャンバー１の内周面を保護している。遮蔽部材９はチャンバー１をイオン攻撃から防止し、またプラズマ副生成物のチャンバー１内壁面への堆積を防止してチャンバー１のクリーニング性を高めている。この遮蔽部材９は基本的にはチャンバー１と同一材質の材料によって形成され、その表面にはチャンバー１と同一に表面処理が施されている。例えば、チャンバー１の表面がアルマイト加工されたアルミニウム製のものであれば、遮蔽部材９も同様にアルマイト処理されたアルミニウムによって形成されている。

【０００５】

【発明が解決しようとする課題】しかしながら、遮蔽部材９は表面の一部がプラズマにより削り取られて表面処理膜が無くなると、プラズマ処理に悪影響を及ぼす虞があるため、従来は削り取られた部分が限られた部分であってもその時点で遮蔽部材９の寿命と判断し、遮蔽部材９を交換しなけらばならないという課題があった。しかも、遮蔽部材９自体の製作費が高価であるため、遮蔽部材９の交換コストが高くなるという課題があった。

【０００６】本発明は、上記課題を解決するためになされたもので、処理容器の内壁面または遮蔽部材のプラズマによる損傷から防止して遮蔽部材を繰り返し使用することができ、ひいてはプラズマ処理コストの低減に寄与することができ、しかもプラズマ副生成物の処理容器内周面への堆積を防止してクリーニング性を高めることができるプラズマ処理装置及びその組立方法を提供することを目的としている。

【０００７】

【課題を解決するための手段】本発明の請求項１に記載のプラズマ処理装置は、処理容器内でプラズマを発生させ、上記処理容器内に配置された被処理体にプラズマ処理を施すプラズマ処理装置において、上記処理容器のプラズマと接触する内周面に樹脂板を交換可能に装着し、且つ上記樹脂板に周方向の圧縮応力を付与したことを特徴とするものである。

【０００８】また、本発明の請求項２に記載のプラズマ処理装置は、処理容器内で被処理体を支持する支持体と、この支持体で支持された被処理体を処理するためのプラズマから上記処理容器の内周面を遮蔽する遮蔽部材と、この遮蔽部材と上記支持体との隙間に配置され且つ処理容器内のガスを分散して排出する分散板とを備えたプラズマ処理装置において、上記遮蔽部材の内周面に樹脂板を交換可能に装着し、且つ上記樹脂板に周方向の圧縮応力を付与したことを特徴とするものである。

【０００９】また、本発明の請求項３に記載のプラズマ処理装置は、請求項２に記載の発明において、少なくとも上記分散板で区画されるプラズマ領域に位置する上記遮蔽部材に上記樹脂板を装着したことを特徴とするものである。

【００１０】また、本発明の請求項４に記載のプラズマ処理装置は、請求項１～請求項３のいずれか１項に記載の発明において、上記樹脂板を帯状または円筒状に形成したことを特徴とするものである。

【００１１】また、本発明の請求項５に記載のプラズマ処理装置は、請求項１～請求項４のいずれか１項に記載の発明において、上記帯状の樹脂板から円筒状に形成された樹脂板または上記円筒状の樹脂板の外周長さを上記処理容器の内周面または上記遮蔽部材の内周面の円周長さより０．１～０．４％長く設定したことを特徴とするものである。

【００１２】また、本発明の請求項６に記載のプラズマ処理装置の組立方法は、処理容器内でプラズマを発生させ、上記処理容器内に配置された被処理体にプラズマ処理を施すプラズマ処理装置を組み立てる方法であって、帯状の樹脂板の両端部を重ねて上記処理容器の内周長さよりも長い外周長さを有する円筒状に形成する工程と、上記円筒状の樹脂板の一部を内側に撓ませて上記処理容器の内面に合わせる工程と、上記撓ませた樹脂板を元の円筒状に復元させて上記樹脂板に周方向の圧縮応力を付与する工程とを備えたことを特徴とするものである。

【００１３】また、本発明の請求項７に記載のプラズマ処理装置の組立方法は、処理容器内でプラズマを発生させ、上記処理容器内に配置された被処理体にプラズマ処理を施すプラズマ処理装置を組み立てる方法であって、上記処理容器の内周長さよりも長い外周長さを有する円筒状の樹脂板の一部を内側に撓ませて上記処理容器の内面に合わせる工程と、上記撓ませた樹脂板を元の円筒状に復元させて上記樹脂板に周方向の圧縮応力を付与する工程とを備えたことを特徴とするものである。

【００１４】また、本発明の請求項８に記載のプラズマ処理装置の組立方法は、処理容器内で被処理体を支持する支持体と、この支持体で支持された被処理体を処理するためのプラズマから上記処理容器の内周面を遮蔽する遮蔽部材と、この遮蔽部材の内周面に樹脂板を交換可能に装着されたプラズマ処理装置を組み立てる方法であって、帯状の樹脂板の両端部を重ねて上記遮蔽部材の内周長さよりも長い外周長さを有する円筒状に形成する工程と、上記円筒状の樹脂板の一部を内側に撓ませて上記遮蔽部材の内面に合わせる工程と、上記撓ませた樹脂板を元の円筒状に復元させて上記樹脂板に周方向の圧縮応力を付与する工程とを備えたことを特徴とするものである。

【００１５】また、本発明の請求項９に記載のプラズマ処理装置の組立方法は、処理容器内で被処理体を支持する支持体と、この支持体で支持された被処理体を処理するためのプラズマから上記処理容器の内周面を遮蔽する

遮蔽部材と、この遮蔽部材の内周面に樹脂板を交換可能に装着されたプラズマ処理装置を組み立てる方法であって、上記遮蔽部材の内周長さよりも長い外周長さを有する円筒状の樹脂板の一部を内側に撓ませて上記遮蔽部材の内面に合わせる工程と、上記撓ませた樹脂板を元の円筒状に復元させて上記樹脂板に周方向の圧縮応力を付与する工程とを備えたことを特徴とするものである。

【００１６】

【発明の実施の形態】以下、図１～図５に示す実施形態に基づいて本発明を説明する。本実施形態のプラズマ処理装置１０は、例えば図１に示すように、チャンバー１１と、チャンバー１１内でウエハWを載置する昇降可能な下部電極１２と、この下部電極１２の上方に下部電極１２と平行に配置された上部電極１３とを備え、基本構造は従来のプラズマ処理装置に準じて構成されている。下部電極１２にはバイアス発生用の高周波電源１４が整合器１４Ａを介して接続され、上部電極１３にはプラズマ発生用の高周波電源１５が整合器１５Ａを介して接続されている。下部電極１２の表面には静電チャック１６が装着され、直流電源１６Ａからの高電圧によってウエハWを静電吸着する。

【００１７】また、下部電極１２の外周縁部には炭化珪素等のセラミックからなるフォーカスリング１２Ａが配設され、フォーカスリング１２Ａを介して下部電極１２と上部電極１３間で発生したプラズマをウエハWに集めるようにしている。また、下部電極１２のプラズマと接触する部分には例えば石英からなる保護カバー１２Ｂが被覆され、保護カバー１２Ｂによって下部電極１２をプラズマから保護している。上部電極１３は例えば中空部１３Ａを有し、その上面中央のガス受給孔１３Ｂから処理用ガスを受給し、その下部１３Ｃに形成された供給孔１３Ｄからチャンバー１１内へ処理用ガスを供給するようになっている。尚、図１において、１７はベローズである。

【００１８】上記下部電極１２の上端部には円環状の分散板（バッフルプレート）１８が取り付けられ、プラズマ処理後のガスをバッフルプレート１８の全周に渡って形成された孔１８Ａを介してプラズマ処理部１１Ａから排気部１１Ｂ側へ排出するようにしている。このバッフルプレート１８は例えばアルマイト加工されたアルミニウムによって形成されている。

【００１９】而して、図１に示すように上記チャンバー１１の上部内周面には上端にフランジ部を有する筒状の遮蔽部材１９が装着されている。この遮蔽部材１９は、例えば表面がアルマイト加工されたアルミニウムによって形成され、チャンバー１１の内周面を被覆している。更に、本実施形態では、遮蔽部材１９の内周面には樹脂板２０が交換可能に装着されている。この樹脂板２０は、例えば耐熱性樹脂によって形成されている。耐熱性樹脂であれば特に制限されないが、例えばベスペル（デュポン社の商品名）等のポリイミド系樹脂、セラゾール（クラリアント社の商品名）等のポリイミドアミド系樹脂及び四フッ化エチレン系樹脂等が樹脂板２０として好ましく用いられる。尚、遮蔽部材１９の材料は例えばチャンバー１１の材質に合わせて選択される。

【００２０】上記樹脂板２０は、例えば図２に示すように帯状に形成されている。その両端には同図の（ａ）、（ｂ）に示すように重合部２０Ａ、２０Ｂとなる薄肉部が形成されている。そして、樹脂板２０を遮蔽部材１９に装着する際に、樹脂板２０を同図の（ｃ）に示すよう丸めた後、同図（ｄ）に示すよう両端の重合部２０Ａ、２０Ｂを重ね合わせて円筒状に形成する。帯状の樹脂板２０は円筒状に形成された段階で遮蔽部材１９へ装着する前の外周長さが遮蔽部材１９の内周長さより０．１～０．４％長く設定されている。このように重合部２０Ａ、２０Ｂを重ねて円筒状に形成された樹脂板２０の外周長さを遮蔽部材１９の内周長さより長く設定することにより、樹脂板２０が遮蔽部材１９に装着された場合に、重合部２０Ａ、２０Ｂが重なった部分では一方の端面が他方の重合部の段部に当接しているため、樹脂板２０内に同図（ｄ）の矢印で示す周方向の圧縮応力が働いて樹脂板２０が遮蔽部材１９に密着し、遮蔽部材１９から外れないようになる。また、樹脂板２０の幅方向の長さは、少なくともプラズマ処理時のバッフルプレート１８よりも上方の領域で遮蔽部材１９の内周面を被覆する寸法に設定され、遮蔽部材１９が直にプラズマに曝されないようにしてある。この幅寸法より長く設定し、バッフルプレート１８よりも下方に達していることが好ましい。樹脂板２０の厚さは適宜設定することができるが、製作上１．５～２．０ｍｍ程度に設定することが好ましい。尚、図２において、２０Ｃは終点検出用の窓に対応する孔である。

【００２１】ところで、上記帯状の樹脂板２０は長手方向の寸法を高精度に設定することが極めて重要である。その長さが長すぎても短すぎても樹脂板２０を遮蔽部材１９に対して密着した状態で装着させることが難しい。そこで、本実施形態では図３に示す治具５０を用いて樹脂板２０の長さを厳密に設定する。この治具５０は、例えばアルミニウムによって長尺状に形成された一対のプレート５１、５１と、これら両プレート５１、５１によって挟持された肉厚設定部材５２と、肉厚設定部材５２を挟持した状態で両プレート５１、５１を連結固定する複数のネジ部材５３と、両プレート５１、５１の一端を塞ぐ係止プレート５４とを有している。また、両プレート５１、５１の幅方向上端の内側にはテーパ面５１Ａ、５１Ａが形成され、これらのテーパ面５１Ａ、５１Ａが樹脂板２０を治具５０内に挿入する際のガイド面になっている。この治具５０は恒温室（図示せず）内で保存され、常に一定の温度（例えば、２３±３℃）で使用して樹脂板２０の長さを厳密に設定できる状態にしてある。

樹脂板２０の寸法を設定する場合には、樹脂板２０を治具５０の両プレート５１、５１間に挿入し、その一端を係止プレート５４に当接させる。治具５０の他端から樹脂板２０に他端が僅かに突出し、突出部分を裁断することで樹脂板２０を所定の長さに厳密に設定することができる。また、この治具５０は出荷検査用の治具として用いることもできる。

【００２２】次に、帯状の樹脂板２０を遮蔽部材１９に装着する方法について図４を参照しながら説明する。帯状の樹脂板２０の両端の重合部２０Ａ、２０Ｂを重ね合わせて円筒状にする。この状態で図４にしめすように、円筒状の一部を内側に撓ませて遮蔽部材１９内へ入り易いようにする。次いで、同図の矢印で示すように樹脂板２０の円筒状の部分を遮蔽部材１９の内周面に重ねた後、内側に撓んだ部分を遮蔽部材１９の内周面側へ押し戻して円筒状態に復元し、樹脂板２０全周を遮蔽部材１９の内周面に密着させる。円筒状の樹脂板２０の外周長さは遮蔽部材１９の内周長さより０．１～０．４％を長く設定されているため、樹脂板２０は遮蔽部材１９と密着した状態でその周方向に圧縮応力が働くと共にその反力が円筒状の樹脂板２０の周方向に働き、ひいては樹脂板２０が拡径して遮蔽部材１９の内周面に強固に密着し、このままでは遮蔽部材１９から簡単には外れない状態になる。尚、図４において、遮蔽部材１９の内周面に形成された段部１９Ａは樹脂部材２０の下端が当接する段部である。

【００２３】上記樹脂板２０が装着された遮蔽部材１９をチャンバー１１の内周面に装着すると、図１に示すようにプラズマ発生領域のチャンバー１１の内周面は樹脂板２０によって被覆されたプラズマ処理装置１０が構成される。このプラズマ処理装置１０を用いてウエハWに対してプラズマ処理を施すと、プラズマ電位とチャンバー１１のグランド電位との電位差によってプラズマ中のイオンがチャンバー１１の内周面を攻撃する。ところが、本実施形態ではチャンバー１１の内周面に装着された遮蔽部材１９が樹脂板２０によって被覆されているため、樹脂板２０が犠牲になって遮蔽部材１９の損傷を防止する。また、従来のようにイオンが遮蔽部材１９を直接攻撃しないため、イオンスパッタに起因するパーティクルが遮蔽部材１９から発生することがなく、プラズマ処理の歩留まりを向上させることができる。プラズマ処理で樹脂板２０が消耗した場合には、樹脂板２０を交換するだけで遮蔽部材１９自体は繰り返し使用することができる。しかも樹脂板２０を遮蔽部材１９に対して簡単に着脱することができるため、装置現場において簡単に樹脂板２０を交換することができる。

【００２４】また、プラズマ中に副生成物が発生すると、この副生成物は樹脂板２０の内周面に堆積し、副生成物が遮蔽部材１９に直接堆積することはない。従って、チャンバー１１をクリーニングする際には樹脂板２０を交換するだけでこの部分のクリーニングを行わなくても良く、クリーニング性を高めることができる。

【００２５】以上説明したように本実施形態によれば、遮蔽部材１９の内周面に樹脂板２０を交換可能に装着し、且つ樹脂板２０に周方向の圧縮応力を付与したため、樹脂板２０と遮蔽部材１９の間にプラズマが回り込んで遮蔽部材１９が損傷することを防止することができる。また、樹脂板２０が摩滅しても樹脂板２０を交換するだけで高価な遮蔽部材１９をそのまま繰り返し使用することができるため、プラズマ処理のコスト低減に寄与することができる。樹脂板２０の交換自体も装置現場で簡単に行うことができる。また、プラズマ副生成物は樹脂板２０に堆積し、遮蔽部材１９には直接堆積しないため、プラズマ損傷による樹脂板２０の交換によりチャンバー１１内周面のクリーニングを省略することができ、クリーニング性を高めることができる。また、樹脂板１０は軽量であり、しかもスペースを取らないため、予備品としての保管が容易である。

【００２６】また、図５は本発明の他の実施形態に係る樹脂板２０’を遮蔽部材１９に装着する状態を示す図である。この樹脂板２０’は最初から円筒状に形成されている。その周方向の長さは帯状の樹脂板２０を円筒状にした場合と同じ長さになっている。つまり、円筒状の樹脂板２０’は遮蔽部材１９へ装着する前の外周長さが遮蔽部材１９の内周長さより０．１～０．４％長く設定されている。この円筒状の樹脂板２０’を遮蔽部材１９に装着する場合には、図４に示す場合と同様に円筒状の樹脂板２０’の一部を内側に撓ませつつ、遮蔽部材１９内へ樹脂板２０’を装着する。樹脂板２０’が装着されると、樹脂板２０’には周方向の圧縮応力が作用すると共に樹脂板２０’を拡径させる力が作用し、樹脂板２０’が遮蔽部材１９と密着する。本実施形態においても上記実施形態と同様の作用効果を期することができる。尚、図５において、遮蔽部材１９の内周面に形成された段部１９Ａは樹脂部材２０の下端が当接する段部である。

【００２７】尚、上記各実施形態では樹脂板２０、２０’を遮蔽部材１９に装着する場合について説明したが、遮蔽部材の無い場合には上記各実施形態と同様の方法でチャンバー（処理容器）の内壁面に直接樹脂板を装着すれば、上記各実施形態と同様の作用効果を期することができる。また、本発明はプラズマ処理装置の全てに適用することができる。

【００２８】

【発明の効果】本発明の請求項１～請求項９に記載の発明によれば、処理容器の内壁面または遮蔽部材のプラズマによる損傷から防止して処理容器または遮蔽部材を繰り返し使用することができ、ひいてはプラズマ処理コストの低減に寄与することができ、しかもプラズマ副生成物の処理容器内周面への堆積を防止して処理容器または遮蔽部材のクリーニング性を高めることができるプラズ

マ処理装置及びその組立方法を提供することができる。

【図面の簡単な説明】

【図１】本発明のプラズマ処理装置の一実施形態の要部を模式的に示す断面図である。

【図２】図１に示すプラズマ処理装置に用いられた樹脂板を取り出して示す図で、（ａ）は帯状の樹脂板を示す展開図、（ｂ）は（ａ）に示す樹脂板を上方から見た示す平面図、（ｃ）は（ａ）に示す樹脂板を丸めた状態を示す斜視図、（ｄ）は（ａ）に示す樹脂板の両端を重ね合わせた状態を示す長手方向の断面図である。

【図３】図１に示す樹脂板の長さを測定する治具を示す図で、（ａ）は長手方向の断面図、（ｂ）は治具の一端を示す正面図、（ｃ）は治具の他端を示す正面図、（ｄ）は治具の一端の一部を拡大して示す図である。

【図４】図２に示す樹脂板を遮蔽部材に装着する状態を示す斜視図である。

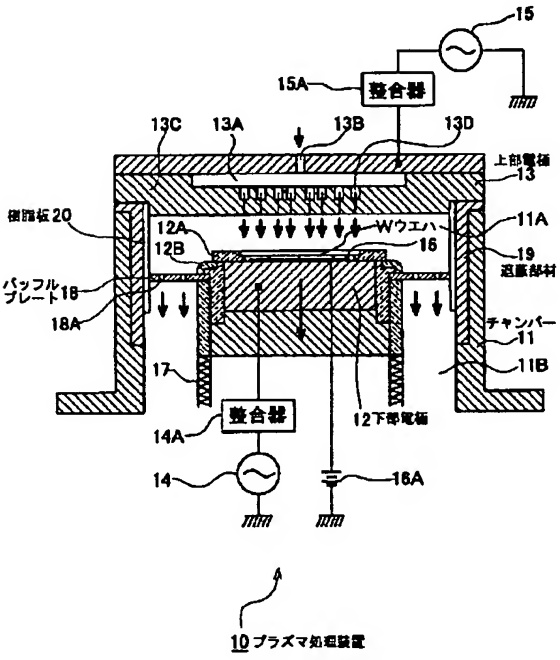
【図５】本発明の他の実施形態に用いられる樹脂板を遮蔽部材に装着する状態を示す斜視図である。

【図６】従来のプラズマ処理装置の構成を模式的に示す断面図である。

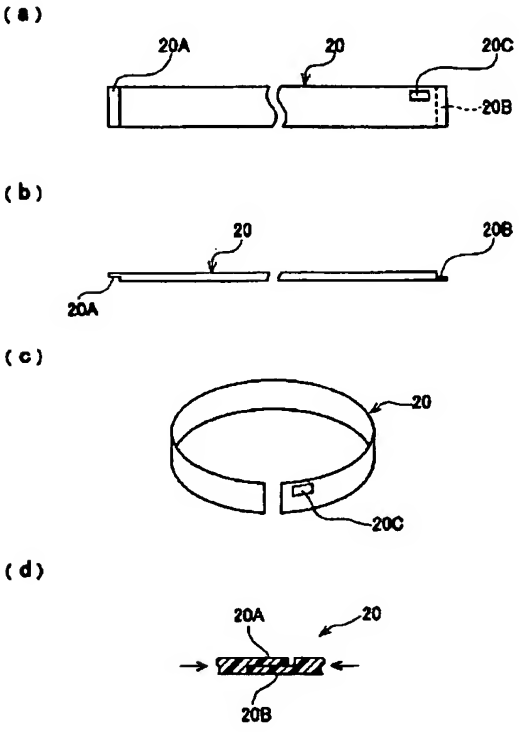
【符号の説明】

１０ プラズマ処理装置
１１ チャンバー（処理容器）
１２ 下部電極（支持体）
１８ バッフルプレート（分散板）
１９ 遮蔽部材
２０、２０’ 樹脂板
Ｗ ウエハ(被処理体)

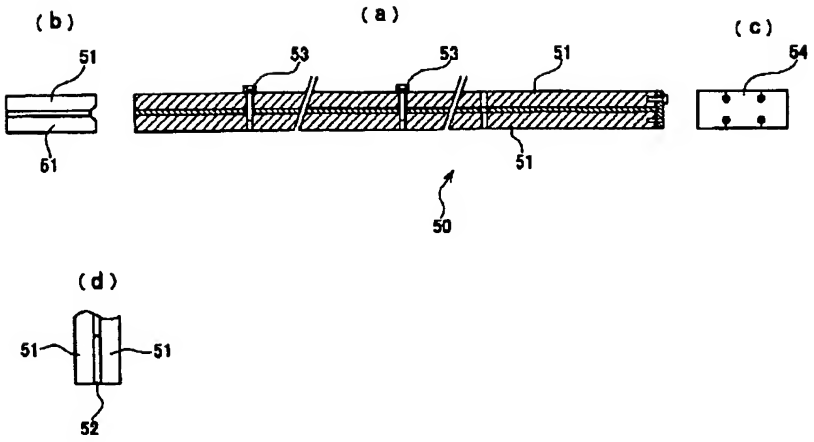
【図１】



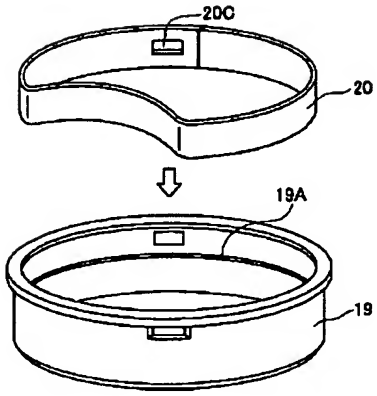
【図２】



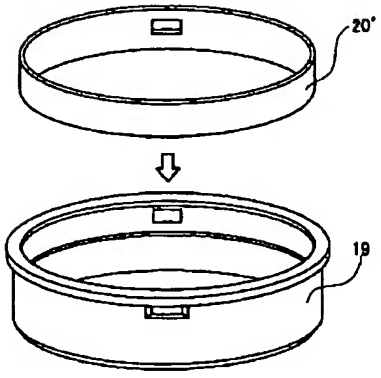
【図3】



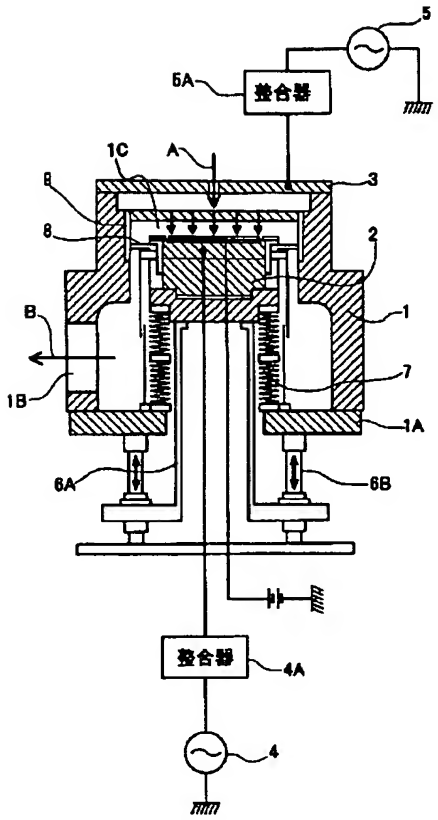
【図4】



【図5】



【図6】



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TITLE: PLASMA PROCESSING APPARATUS AND ITS ASSEMBLING METHOD

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INVENTOR-INFORMATION:

NAME	COUNTRY
TOMOYOSHI, TSUTOMU	N/A
KOIZUMI, KATSUYUKI	N/A

ASSIGNEE-INFORMATION:

NAME	COUNTRY
TOKYO ELECTRON LTD	N/A

APPL-NO: JP2000345008

APPL-DATE: November 13, 2000

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ABSTRACT:

PROBLEM TO BE SOLVED: To overcome the problem of a prior art such that plasma processing is affected adversely when the surface of a shield member 9 is cut off partially by plasma and the surface treatment film is eliminated and, since a decision is made that the life of the shield member 9 has expired even when a limited part thereof is cut off, the shield member 9 must be replaced and a high cost is imposed for replacing the shield member 9.

SOLUTION: The plasma processing apparatus 10 comprises a lower electrode 12 for supporting a wafer W in a chamber 11, a member 19 for shielding the inner circumferential surface of the chamber 11 from plasma for processing the wafer W supported by the lower electrode 12, and a baffle plate 18 disposed in a gap between the shielding member 19 and the lower electrode 12 in order to discharge gas in the chamber 11 while diffusing, wherein a resin plate 20 is fixed replaceably to the inner circumferential surface of the shielding member 19, and the resin plate 20 is imparted with a compressive stress in the circumferential direction.

* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Industrial Application] This invention relates to the plasma treatment equipment which raised the maintenance nature of the inner skin of a processing container, and its assembly approach in more detail about plasma treatment equipment and its assembly approach.
[0002]
[Description of the Prior Art] Plasma treatment equipment For example, the processing container 1 of the airtight structure which can hold a predetermined degree of vacuum as shown in drawing 6 (a "chamber" is called hereafter.), The lower electrode 2 which serves as the installation base arranged at base 1A of this chamber 1, It has the up electrode 3 arranged in parallel with the lower electrode 2 above this lower electrode 2, and from the up electrode 3, into the chamber 1, the gas for plasma treatment, such as etching, is supplied, as A of this drawing shows. RF generator 4 for bias generating is connected to the lower electrode 2 through adjustment machine 4A, and RF generator 5 for plasma generating is connected to the up electrode 3 through adjustment machine 5A. And supplying the gas for plasma treatment from the up electrode 3, each high-frequency power is impressed to the vertical two electrodes 2 and 3, the up-and-down electrode 2 and the plasma predetermined between three are generated, and the gas after use is exhausted from exhaust-port 1B, as an arrow head B shows.
[0003] Moreover, tubed supporter material 6A which penetrates the central hole of base 1A of a chamber 1 is connected to the lower electrode 2, and it connects with drive 6B which has a ball screw etc. in the lower part of base 1A. Bellows 7 is attached between the periphery of supporter material 6A upper limit, and base 1A. Therefore, the lower electrode 2 goes up and down through drive 6B within a chamber 1, and when performing plasma treatment, the lower electrode 2 has formed the clearance predetermined between the up electrodes 3.
[0004] The ring-like baffle plate 8 is attached near the upper limit of the lower electrode 2, and the gas after use is discharged from plasma treatment section 1C in a chamber 1 to exhaust air section 1B through a baffle plate 8. Moreover, the covered member 9 was attached in the inner skin of a chamber 1 removable, and the inner skin of a chamber 1 is protected by the covered member 9. The covered member 9 prevents a chamber 1 from an ion attack, and prevents deposition in chamber 1 internal surface of a plasma by-product, and is raising the cleaning nature of a chamber 1. This covered member 9 is fundamentally formed with the ingredient of the same quality of the material as a chamber 1, and surface treatment is performed to that front face identically to a chamber 1. For example, if the front face of a chamber 1 is the thing made from aluminum by which alumite processing was carried out, it is formed of the aluminum by which alumite processing also of the covered member 9 was carried out similarly.
[0005]
[Problem(s) to be Solved by the Invention] However, since there was a possibility of having a bad influence on plasma treatment when surface [a part of] is shaved off by the plasma and the surface treatment film is lost, even if the covered member 9 was the part to which the shaved-off part was

restricted conventionally, it was judged to be the life of the covered member 9 at the time, and when kicking, it had the technical problem exchanged for the covered member 9 that it did not become. And since the manufacturing cost of covered member 9 the very thing was expensive, the technical problem that the exchange cost of the covered member 9 became high occurred.
[0006] This invention was made in order to solve the above-mentioned technical problem, and it can be prevented from damage by the internal surface of a processing container, or the plasma of a covered member, and a covered member can be repeated and used for it. As a result, it can contribute to reduction of plasma treatment cost, and aims at offering the plasma treatment equipment which can moreover prevent deposition in the processing container inner skin of a plasma by-product, and can raise cleaning nature, and its assembly approach.
[0007]
[Means for Solving the Problem] The plasma treatment equipment of this invention according to claim 1 is characterized by having generated the plasma within the processing container, and having equipped the inner skin in contact with the plasma of the above-mentioned processing container with the resin plate exchangeable in the plasma treatment equipment which performs plasma treatment to the processed object arranged in the above-mentioned processing container, and giving the compressive stress of a hoop direction to the above-mentioned resin plate.
[0008] Moreover, the plasma treatment equipment of this invention according to claim 2 The covered member which covers the inner skin of the above-mentioned processing container from the plasma for processing the base material which supports a processed object within a processing container, and the processed object supported with this base material, It is characterized by having been arranged in the clearance between this covered member and the above-mentioned base material, having equipped the inner skin of the above-mentioned covered member with the resin plate exchangeable in plasma treatment equipment equipped with the distributor which distributes and discharges the gas in a processing container, and giving the compressive stress of a hoop direction to the above-mentioned resin plate.
[0009] Moreover, the plasma treatment equipment of this invention according to claim 3 is characterized by equipping with the above-mentioned resin plate the above-mentioned covered member located in the plasma field divided with the above-mentioned distributor at least in invention according to claim 2.
[0010] Moreover, the plasma treatment equipment of this invention according to claim 4 is characterized by forming the above-mentioned resin plate band-like or in the shape of a cylinder in invention given in any 1 term of claim 1 - claim 3.
[0011] Moreover, the plasma treatment equipment of this invention according to claim 5 is characterized by setting up the periphery die length of the resin plate formed in the shape of a cylinder from the above-mentioned band-like resin plate, or the cylinder resin plate of the above in invention given in any 1 term of claim 1 - claim 4 for a long time 0.1 to 0.4% than the periphery length of the inner skin of the above-mentioned processing container, or the inner skin of the above-mentioned covered member.
[0012] Moreover, the assembly approach of the plasma treatment equipment of this invention according to claim 6 It is the approach of assembling the plasma treatment equipment which performs plasma treatment to the processed object which was made to generate the plasma within a processing container and has been arranged in the above-mentioned processing container. The process which forms the both ends of a band-like resin plate in the shape of [which has periphery die length / in piles / longer than the inner circumference die length of the above-mentioned processing container] a cylinder, With the process which it is made to bend inside and sets some cylinder resin plates of the above by the inside of the above-mentioned processing container, it is characterized by having the process which is made to restore the sagged resin plate in the shape of [original] a cylinder, and gives the compressive stress of a hoop direction to the above-mentioned resin plate the account of a top.
[0013] Moreover, the assembly approach of the plasma treatment equipment of this invention according to claim 7 It is the approach of assembling the plasma treatment equipment which performs plasma treatment to the processed object which was made to generate the plasma within a processing container and has been arranged in the above-mentioned processing container. The process which it is made to

bend inside and sets some resin plates of the shape of a cylinder which has periphery die length longer than the inner circumference die length of the above-mentioned processing container by the inside of the above-mentioned processing container, It is characterized by having the process which is made to restore the sagged resin plate in the shape of [original] a cylinder, and gives the compressive stress of a hoop direction to the above-mentioned resin plate the account of a top.
[0014] Moreover, the assembly approach of the plasma treatment equipment of this invention according to claim 8 The covered member which covers the inner skin of the above-mentioned processing container from the plasma for processing the base material which supports a processed object within a processing container, and the processed object supported with this base material, The process which is the approach of assembling the plasma treatment equipment equipped with the resin plate by the inner skin of this covered member exchangeable, and forms the both ends of a band-like resin plate in the shape of [which has periphery die length / in piles / longer than the inner circumference die length of the above-mentioned covered member] a cylinder, With the process which it is made to bend inside and sets some cylinder resin plates of the above by the inside of the above-mentioned covered member, it is characterized by having the process which is made to restore the sagged resin plate in the shape of [original] a cylinder, and gives the compressive stress of a hoop direction to the above-mentioned resin plate the account of a top.
[0015] Moreover, the assembly approach of the plasma treatment equipment of this invention according to claim 9 The covered member which covers the inner skin of the above-mentioned processing container from the plasma for processing the base material which supports a processed object within a processing container, and the processed object supported with this base material, It is the approach of assembling the plasma treatment equipment equipped with the resin plate by the inner skin of this covered member exchangeable. The process which it is made to bend inside and sets some resin plates of the shape of a cylinder which has periphery die length longer than the inner circumference die length of the above-mentioned covered member by the inside of the above-mentioned covered member, It is characterized by having the process which is made to restore the sagged resin plate in the shape of [original] a cylinder, and gives the compressive stress of a hoop direction to the above-mentioned resin plate the account of a top.
[0016]
[Embodiment of the Invention] Hereafter, this invention is explained based on the operation gestalt shown in drawing 1 - drawing 5 . The plasma treatment equipment 10 of this operation gestalt is equipped with the lower electrode 12 which lays Wafer W within a chamber 11 and a chamber 11 as shown in drawing 1 and which can be gone up and down, and the up electrode 13 arranged in parallel with the lower electrode 12 above this lower electrode 12, and basic structure is constituted according to conventional plasma treatment equipment. RF generator 14 for bias generating is connected to the lower electrode 12 through adjustment machine 14A, and RF generator 15 for plasma generating is connected to the up electrode 13 through adjustment machine 15A. The front face of the lower electrode 12 is equipped with the electrostatic chuck 16, and electrostatic adsorption of the wafer W is carried out with the high voltage from DC-power-supply 16A.
[0017] Moreover, focal ring 12A which consists of ceramics, such as silicon carbide, is arranged in the periphery edge of the lower electrode 12, and he is trying to bring together the plasma generated between the lower electrode 12 and the up electrode 13 through focal ring 12A in Wafer W. Moreover, protective cover 12B which becomes a part in contact with the plasma of the lower electrode 12 from a quartz was covered, and the lower electrode 12 is protected from the plasma by protective cover 12B. It has centrum 13A, the gas for processing is received from gas receipt hole 13B of the center of a top face, and the up electrode 13 supplies the gas for processing for example, into a chamber 11 from feed-holes 13D formed in the lower 13C. In addition, in drawing 1 , 17 is bellows.
[0018] The circular ring-like distributor (baffle plate) 18 is attached in the upper limit section of the above-mentioned lower electrode 12, and he is trying to discharge the gas after plasma treatment from plasma treatment section 11A to the exhaust air section 11B side through hole 18A formed over the perimeter of a baffle plate 18. This baffle plate 18 is formed of the aluminum by which alumite

processing was carried out, for example.
[0019] It **, and as shown in drawing 1 , the up inner skin of the above-mentioned chamber 11 is equipped with the tubed covered member 19 which has a flange in upper limit. The front face was formed of the aluminum by which alumite processing was carried out, and this covered member 19 has covered the inner skin of a chamber 11. Furthermore, with this operation gestalt, the inner skin of the covered member 19 is equipped with the resin plate 20 exchangeable. This resin plate 20 is formed with heat resistant resin. Although it will not be restricted especially if it is heat resistant resin, polyimidoamide system resin, tetrafluoroethylene system resin, etc., such as polyimide system resin, such as BESUPERU (trade name of Du Pont), and SERAZORU (trade name of Clariant, LTD.), are preferably used as a resin plate 20, for example. In addition, the ingredient of the covered member 19 is chosen according to the quality of the material of a chamber 11.
[0020] The above-mentioned resin plate 20 is formed in band-like as shown in drawing 2 . The thin-walled part which turns into the polymerization sections 20A and 20B as shown in (a) of this drawing and (b) is formed in the both ends. And after rounding off the resin plate 20 as shown in (c) of this drawing in case the covered member 19 is equipped with the resin plate 20, as shown in this drawing (d), the polymerization sections 20A and 20B of both ends are piled up, and it forms in the shape of a cylinder. The periphery die length before equipping the covered member 19 with the band-like resin plate 20 in the phase formed in the shape of a cylinder is set up for a long time 0.1 to 0.4% than the inner circumference die length of the covered member 19. Thus, by setting up the periphery die length of the resin plate 20 formed in the shape of a cylinder in piles in the polymerization sections 20A and 20B for a long time than the inner circumference die length of the covered member 19 Since one end face is in contact with the step of the polymerization section of another side in the part with which the polymerization sections 20A and 20B lapped when the covered member 19 is equipped with the resin plate 20, The compressive stress of the hoop direction shown by the arrow head of this drawing (d) in the resin plate 20 works, and the resin plate 20 sticks at the covered member 19, and ceases to separate from the covered member 19. Moreover, the die length of the cross direction of the resin plate 20 is set as the dimension which covers the inner skin of the covered member 19 with an upper field rather than the baffle plate 18 at the time of plasma treatment at least, and it is made not to be soon put in the covered member 19 at the plasma. It sets up for a long time than this width-of-face dimension, and having reached caudad is more desirable than a baffle plate 18. Although the thickness of the resin plate 20 can be set up suitably, it is desirable to set it as about 1.5-2.0mm on manufacture. In addition, in drawing 2 , 20C is a hole corresponding to the aperture for terminal point detection.
[0021] By the way, it is very important for the above-mentioned band-like resin plate 20 to set up the dimension of a longitudinal direction with high precision. Even if the die length is too long and it is too short, it is difficult to make it equip, where the resin plate 20 is stuck to the covered member 19. So, with this operation gestalt, the die length of the resin plate 20 is strictly set up using the fixture 50 shown in drawing 3 . This fixture 50 has the thick setting member 52 pinched with the plates 51 and 51 and both [these] the plates 51 and 51 of the pair formed in the shape of a long picture of aluminum, two or more screw members 53 which carry out connection immobilization of both the plates 51 and 51 where the thick setting member 52 is pinched, and the stop plate 54 which plugs up the end of both the plates 51 and 51. Moreover, inside the crosswise upper limit of both the plates 51 and 51, the taper sides 51A and 51A are formed, and it has become a guide side at the time of these taper sides 51A and 51A inserting the resin plate 20 into a fixture 50. This fixture 50 is saved in a thermostatic chamber (not shown), and is changed into the condition that it is always used at fixed temperature (for example, 23**3 degrees C), and the die length of the resin plate 20 can be set up strictly. When setting up the dimension of the resin plate 20, the resin plate 20 is inserted between both the plates 51 of a fixture 50, and 51, and the end is made to contact the stop plate 54. From the other end of a fixture 50, the resin plate 20 can be strictly set as predetermined die length because the other end judges a part for a projection and a lobe slightly to the resin plate 20. Moreover, this fixture 50 can also be used as a fixture for outgoing inspections.
[0022] Next, it explains, referring to drawing 4 about the approach of equipping the covered member 19

with the band-like resin plate 20. The polymerization sections 20A and 20B of the both ends of the band-like resin plate 20 are piled up, and it is made the shape of a cylinder. The shape of a part of cylinder is sagged inside, and it is made to be easy to enter into the covered member 19 so that it may be shown in drawing 4 in this condition. Subsequently, as the arrow head of this drawing shows, after putting the part of the shape of a cylinder of the resin plate 20 on the inner skin of the covered member 19, the part which bent inside is put back to the inner skin side of the covered member 19, it restores to a cylinder condition, and the resin plate 20 perimeter is stuck to the inner skin of the covered member 19. Since the periphery die length of the cylinder-like resin plate 20 is set up for a long time 0.1 to 0.4% than the inner circumference die length of the covered member 19, While compressive stress works to that hoop direction in the condition of having stuck with the covered member 19, that reaction force works to the hoop direction of the cylinder-like resin plate 20, as a result the resin plate 20 expands the diameter of the resin plate 20, it is firmly stuck to the inner skin of the covered member 19, and, at this rate, will be in the condition of not separating simply from the covered member 19. In addition, in drawing 4 , step 19A formed in the inner skin of the covered member 19 is a step which the lower limit of the resin member 20 contacts.

[0023] When the inner skin of a chamber 11 is equipped with the covered member 19 equipped with the above-mentioned resin plate 20, as shown in drawing 1 , the plasma treatment equipment 10 by which the inner skin of the chamber 11 of a plasma generating field was covered with the resin plate 20 is constituted. If plasma treatment is performed to Wafer W using this plasma treatment equipment 10, the ion in the plasma will attack the inner skin of a chamber 11 according to the potential difference of plasma potential and the ground potential of a chamber 11. However, since the covered member 19 with which the inner skin of a chamber 11 was equipped is covered with this operation gestalt by the resin plate 20, the resin plate 20 falls victim and prevents damage on the covered member 19. Moreover, since ion does not carry out the direct attack of the covered member 19 like before, the particle resulting from an ion spatter cannot occur from the covered member 19, and can raise the yield of plasma treatment. When the resin plate 20 is exhausted by plasma treatment, covered member 19 the very thing can be repeatedly used only by exchanging the resin plate 20. And since the resin plate 20 can be easily detached and attached to the covered member 19, in an equipment site, the resin plate 20 is easily exchangeable.

[0024] Moreover, if a by-product occurs in the plasma, this by-product will be deposited on the inner skin of the resin plate 20, and a by-product will not deposit it on the covered member 19 directly. Therefore, in case a chamber 11 is cleaned, it is not necessary to clean this part only by exchanging the resin plate 20, and cleaning nature can be raised.

[0025] Since the inner skin of the covered member 19 was equipped with the resin plate 20 exchangeable according to this operation gestalt as explained above, and the compressive stress of a hoop direction was given to the resin plate 20, it can prevent that the plasma turns between the resin plate 20 and the covered member 19, and the covered member 19 is damaged. Moreover, since the expensive covered member 19 can be repeated as it is and can be used only by exchanging the resin plate 20 even if the resin plate 20 wears out, it can contribute to the cost reduction of plasma treatment. The exchange of the resin plate 20 itself can be performed easily in an equipment site. Moreover, since a plasma by-product is deposited on the resin plate 20 and is not directly deposited on the covered member 19, it can omit cleaning of chamber 11 inner skin by exchange of the resin plate 20 by plasma damage, and can raise cleaning nature. Moreover, the resin plate 10 is lightweight, and in order that it moreover may not take a tooth space, the storage as spare parts is easy for it.

[0026] Moreover, drawing 5 is drawing showing the condition of equipping the covered member 19 with resin plate 20' concerning other operation gestalten of this invention. This resin plate 20' is formed in the shape of a cylinder from the beginning. The die length of the hoop direction is the same die length as the case where the band-like resin plate 20 is made into the shape of a cylinder. That is, the periphery die length before equipping the covered member 19 is longer than the inner circumference die length of the covered member 19 0.1 to 0.4%, and cylinder-like resin plate 20' is set up. It equips with resin plate 20' into the covered member 19, sagging a part of cylinder-like resin plate 20' inside like the case where

it is shown in drawing 4 , in equipping the covered member 19 with resin plate 20' of the shape of this cylinder. If equipped with resin plate 20', while the compressive stress of a hoop direction acts on resin plate 20', the force of making the diameter of resin plate 20' expanding will act, and resin plate 20' will stick with the covered member 19. Also in this operation gestalt, the same operation effectiveness as the above-mentioned operation gestalt can be expected. In addition, in drawing 5 , step 19A formed in the inner skin of the covered member 19 is a step which the lower limit of the resin member 20 contacts.
[0027] In addition, although each above-mentioned operation gestalt explained the case where the covered member 19 was equipped with the resin plate 20 and 20', if the internal surface of a chamber (processing container) is equipped with a direct resin plate by the same approach as each above-mentioned operation gestalt when there is no covered member, the same operation effectiveness as each above-mentioned operation gestalt can be expected. Moreover, this invention is applicable to all the plasma treatment equipments.
[0028]
[Effect of the Invention] According to invention of this invention according to claim 1 to 9, it can prevent from damage by the internal surface of a processing container, or the plasma of a covered member, and a processing container or a covered member can be repeated and used. As a result, it can contribute to reduction of plasma treatment cost, and the plasma treatment equipment which can moreover prevent deposition in the processing container inner skin of a plasma by-product, and can raise the cleaning nature of a processing container or a covered member, and its assembly approach can be offered.

[Translation done.]

* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

CLAIMS

[Claim(s)]
[Claim 1] Plasma treatment equipment characterized by having generated the plasma within the processing container, and having equipped the inner skin in contact with the plasma of the above-mentioned processing container with the resin plate exchangeable in the plasma treatment equipment which performs plasma treatment to the processed object arranged in the above-mentioned processing container, and giving the compressive stress of a hoop direction to the above-mentioned resin plate.
[Claim 2] The covered member which covers the inner skin of the above-mentioned processing container from the plasma for processing the base material which supports a processed object within a processing container, and the processed object supported with this base material, In plasma treatment equipment equipped with the distributor which is arranged in the clearance between this covered member and the above-mentioned base material, and distributes and discharges the gas in a processing container Plasma treatment equipment characterized by having equipped the inner skin of the above-mentioned covered member with the resin plate exchangeable, and giving the compressive stress of a hoop direction to the above-mentioned resin plate.
[Claim 3] Plasma treatment equipment according to claim 2 characterized by equipping with the above-mentioned resin plate the above-mentioned covered member located in the plasma field divided with the above-mentioned distributor at least.
[Claim 4] Plasma treatment equipment given in any 1 term of claim 1 characterized by forming the above-mentioned resin plate band-like or in the shape of a cylinder - claim 3.
[Claim 5] Plasma treatment equipment given in any 1 term of claim 1 characterized by setting up the periphery die length of the resin plate formed in the shape of a cylinder from the above-mentioned band-like resin plate, or the cylinder resin plate of the above for a long time 0.1 to 0.4% than the periphery length of the inner skin of the above-mentioned processing container, or the inner skin of the above-mentioned covered member - claim 4.
[Claim 6] It is the approach of assembling the plasma treatment equipment which performs plasma treatment to the processed object which was made to generate the plasma within a processing container and has been arranged in the above-mentioned processing container. The process which forms the both ends of a band-like resin plate in the shape of [which has periphery die length / in piles / longer than the inner circumference die length of the above-mentioned processing container] a cylinder, The assembly approach of the plasma treatment equipment characterized by having the process which it is made to bend inside and sets some cylinder resin plates of the above by the inside of the above-mentioned processing container, and the process which is made to restore the resin plate sagged the account of a top in the shape of [original] a cylinder, and gives the compressive stress of a hoop direction to the above-mentioned resin plate.
[Claim 7] It is the approach of assembling the plasma treatment equipment which performs plasma treatment to the processed object which was made to generate the plasma within a processing container and has been arranged in the above-mentioned processing container. The process which it is made to bend inside and sets some resin plates of the shape of a cylinder which has periphery die length longer

than the inner circumference die length of the above-mentioned processing container by the inside of the above-mentioned processing container, The assembly approach of the plasma treatment equipment characterized by having the process which is made to restore the resin plate sagged the account of a top in the shape of [original] a cylinder, and gives the compressive stress of a hoop direction to the above-mentioned resin plate.

[Claim 8] The covered member which covers the inner skin of the above-mentioned processing container from the plasma for processing the base material which supports a processed object within a processing container, and the processed object supported with this base material, The process which is the approach of assembling the plasma treatment equipment equipped with the resin plate by the inner skin of this covered member exchangeable, and forms the both ends of a band-like resin plate in the shape of [which has periphery die length / in piles / longer than the inner circumference die length of the above-mentioned covered member] a cylinder, The assembly approach of the plasma treatment equipment characterized by having the process which it is made to bend inside and sets some cylinder resin plates of the above by the inside of the above-mentioned covered member, and the process which is made to restore the resin plate sagged the account of a top in the shape of [original] a cylinder, and gives the compressive stress of a hoop direction to the above-mentioned resin plate.

[Claim 9] The covered member which covers the inner skin of the above-mentioned processing container from the plasma for processing the base material which supports a processed object within a processing container, and the processed object supported with this base material, It is the approach of assembling the plasma treatment equipment equipped with the resin plate by the inner skin of this covered member exchangeable. The process which it is made to bend inside and sets some resin plates of the shape of a cylinder which has periphery die length longer than the inner circumference die length of the above-mentioned covered member by the inside of the above-mentioned covered member, The assembly approach of the plasma treatment equipment characterized by having the process which is made to restore the resin plate sagged the account of a top in the shape of [original] a cylinder, and gives the compressive stress of a hoop direction to the above-mentioned resin plate.

[Translation done.]